

Guiding Principles for NASA Authorization Legislation

The Association of American Universities (AAU) is an association of 60 distinguished U.S. research universities with a long and storied history of engagement with NASA. Each year, AAU institutions receive millions of dollars from NASA to conduct ground-breaking research, develop new space technologies, educate the next generation of world-class scientists and engineers, and inspire future generations to pursue careers in the science, technology, engineering, and mathematics (STEM) disciplines.

The U.S. Congress is positioned to build on a 60-year legacy by providing NASA with robust and sustained federal funding to promote the progress of human and robotic exploration, scientific research, cutting-edge aeronautical research, and space technology development. On behalf of the AAU member institutions, we offer the following set of guiding principles to the Senate Commerce, Science, and Transportation Committee for your consideration, as you begin to draft NASA authorization legislation.

- **Multi-year Authorization Legislation:** A multi-year authorization bill is essential to ensure robust and sustained federal funding for the progress of NASA’s operations, missions, and programs.
- **Stable and Sustainable Funding for NASA:** Since the establishment of NASA in 1958, the importance of its mission has been understood nationally and globally. NASA develops critical technology for our national priorities, serves as a platform for international relations, and inspires the next generation of STEM workers. To accomplish this important mission, it is essential that the next NASA authorization legislation provides stable and sustainable funding for the space agency. We recognize that the U.S. faces a challenging fiscal environment, however, we believe that this investment should be made for continued preeminence and future economic growth in the U.S.
 - The “Innovation: An American Imperative” call-to-action – which was endorsed by over 500 businesses, national associations, scientific societies, and universities -- recommended **at least four-percent “real growth”** for federal research agencies, including NASA.
- **A Sustained Vision for NASA:** As the world’s premier space agency, it is imperative that the Administration and Congress continue to work with the National Academies,

National Space Council, NASA Advisory Councils, industry, and academia to develop and sustain a strategic vision for the country's space program.

- The NASA Transition Authorization Act of 2017 (PL 115-10) underscores the importance of a sustained, long-term vision for the agency across changes in Administrations.

"...honoring current national space commitments and building upon investments in space across successive Administrations demonstrates clear continuity of purpose by the United States, in collaboration with its international, academic, and industry partners..."

- A robust and rigorous research and development portfolio in support of human and robotic exploration is needed to inform and facilitate advances in a variety of technology sectors and disciplines, including aeronautics, agriculture, and space life sciences.

➤ **A Balanced NASA Portfolio Across Programs and Missions:** A balanced portfolio will enable NASA to execute a strategic long-term mission. Science, aeronautics, exploration, and space technology are all vital to the success of NASA's overall mission. NASA Authorization legislation should continue to show a strong commitment to all of NASA's directorates. Likewise, NASA authorization legislation should also underscore the importance of supporting a balanced portfolio of small, medium, and flagship missions.

- The NASA Transition Authorization Act of 2017 (P.L. 115-10) states: "NASA leaders can best leverage investments in the United States space program by continuing to develop a balanced portfolio for space exploration and space science..."
- The National Research Council's decadal surveys are essential to identifying and prioritizing small, medium, and flagship missions in the fields of science, aeronautics, space technology, and exploration. Thus, NASA authorization legislation should continue to support the missions included in the decadal surveys and authorize the funding needed to realize the missions laid-out in the decadal surveys.
- The Science Mission Directorate (SMD) includes Earth Science, Planetary Science, Astrophysics, Heliophysics, and the James Webb Space Telescope. This directorate supports scientists as they seek to answer fundamental questions about the universe through space exploration. These questions

range from predicting hurricane formation to understanding the origin of the Universe. The vital scientific and engineering research supported by SMD is essential to the entire space agency.

- The Space Technology Mission Directorate (STMD) supports partnerships among the federal government, industry, and academia which stimulates the development of innovative and transformative technologies. NASA authorization legislation should acknowledge the impactful role of STMD to NASA's overall mission, specifically the development of both near and long-term transformative technologies that span the entire NASA portfolio. NASA authorization legislation should continue to support an independent STMD.
 - NASA authorization legislation should provide strong support for the science occurring within the Human Exploration Mission Directorate (HEOMD). For example, many universities conduct microgravity research, which resides within HEOMD. This directorate supports scientists as they seek to answer fundamental questions about the life and physical sciences that are influenced by microgravity and the other forces that impact exploration. These questions range from the behaviors of liquids in the absence of gravity to the adaptive processes of life in space. The vital scientific research supported by HEOMD is essential to the entire space agency exploration program and to the commercialization of Low Earth Orbit.
- **A Commitment to Building America's Next Generation Workforce:** A well-educated and well-trained workforce is essential for the successful operation and completion of NASA missions. University-based scientists, engineers, and graduate students provide the skill and expertise needed to complete science, aeronautics, and space technology missions. NASA authorization legislation should continue to support education, outreach, and workforce development efforts.
- The fellowship and internship programs funded by NASA's Office of Education, such as the National Space Grant Fellowship Program, provide valuable support for the education and training of undergraduate and graduate students. NASA should continue to support these opportunities and continue to provide hands-on training opportunities for students.

- Students also rely on the support of research and analysis grant programs that are a part of every mission directorate. NASA should ensure that their balanced portfolio provides funding for R&A grant programs.
- NASA should continue its unique role in inspiring the next generation of scientists and engineers and thus helping to create the future STEM and space workforce.

For the Committee’s consideration, below are programs of importance to several AAU member-institutions:

- The International Space Station (ISS) has served as a platform for international scientific collaboration for many years. Congress should continue to support its use for the conduct of cutting-edge science. The research university community supports the extension of ISS beyond 2024.
- The NASA Authorization Act of 2018 (H.R. 5503) includes language (Sect. 311) supporting the search for the origin, evolution, distribution, and future of life in the universe. We appreciate Congress’ commitment to providing funding for NASA to partner with academia and other stakeholders in the search for “life’s origin, evolution, distribution, and future in the universe.” We would encourage the Committee to include language like H.R. 5503 on the search for intelligent life within the Senate NASA authorization legislation.
- The NASA authorization bill should include language that is supportive of the continued formulation, development, and construction of the Wide-Field Infrared Survey Telescope (WFIRST). WFIRST was ranked as the #1 priority of the 2010 Astrophysics Decadal Survey and would settle essential questions in the areas of dark energy, exoplanets, and infrared astrophysics. It will measure the expansion rate of the universe and the growth of structure to unprecedented. It has more than 100 institutional partners across the country, including several AAU institutions.
- The Interstellar Mapping and Acceleration Probe (IMAP) mission, launching in 2024, will simultaneously investigate two of the most important issues in space physics today: the acceleration of energetic particles and interaction of the solar wind with the interstellar medium. This revolutionary mission includes a suite of ten instruments that will work together to resolve fundamental scientific questions about the local interstellar medium, the boundaries that surround our solar system, and how particles are accelerated to high energies in space. The IMAP team includes collaborators from several AAU universities. The NASA authorization bill should include language

recognizing the selection of IMAP as the next big step in understanding particle acceleration in space and our heliosphere and its interaction with the galaxy.

- High Performance Computing (HPC) is an essential component of space research. From formulation and conceptual design to analysis and mission operations, HPC is necessary for the success of all NASA missions and the theoretical modeling of data. We urge the Committee to make support of HPC a priority in the NASA authorization bill. One option would be to make a requirement that NASA develops a plan to take advantage of the National Strategic Computing Initiative.
- The NASA authorization bill should address the need for the federal government to act to ensure the U.S. is equipped to predict, mitigate, and respond to space weather events. This should be achieved through support for funding research and technology that is necessary to improve our understanding of space weather events. The bill should codify elements of the Space Weather Action Plan and include an opportunity for academic input through the development of a Space Weather Government-Industry-University Roundtable. Such a collaboration will help ensure all stakeholders are working together in a coordinated and efficient fashion.
- The NASA authorization bill should include strong support for NASA's Cube Sat Launch Initiative (CSLI). CSLI provides opportunities for universities and others to conduct scientific investigations at an incredibly low cost. Many AAU institutions rely on CSLI to attract and retain students in STEM fields, while simultaneously carrying out scientific missions in alignment with NASA's Strategic Plan.
- The NASA authorization bill should include language that establishes an Aeronautics Research fellowships modeled after the [Space Technology Research Fellowship program](#) started by former Chief Technologist Bobby Braun and still administered through the CT office (rather than the Mission Directorates).
- We recommend that the Aeronautics Research Mission Directorate conduct an aeronautics decadal survey of external stakeholders to assess and inform issues and opportunities (e.g. autonomy, safety, etc.).
- The NASA authorization bill should include language to encourage support for low-technology-readiness-level, long-term, high-risk research, not exclusively or primarily expensive flight demonstrations. This includes grants to universities, but also could include collaborative agreements between researchers at NASA centers and graduate students. Multi-year funding, explicitly called out in the authorization bill, is necessary for long-term research, which would also support graduate theses.

- The higher education community benefits from the strong support of the Science Mission Directorate's Astrophysics Research and Analysis Program (APRA). This program supports basic research of new technologies that can enable future science missions as well as funding suborbital rocket payloads and instrumentation.
- Universities benefit from the Astrophysics Division's Strategic Astrophysics Technology (SAT) program. This program supports vital research into technology developments specific to reaching flight readiness for strategic NASA missions.
- NASA's Planetary Science Division within the Science Mission Directorate contains many programs of importance to the higher education community. For example, Mars Exploration; Research and Analysis; Discovery; Astrobiology; and New Frontiers programs create a comprehensive and cost-effective portfolio of research and exploration into fundamental questions related to the origin and history of our solar system, as well as the distribution of habitable environments throughout.
- The NASA Support for the National Academies Visions and Voyages for Planetary Science Midterm Assessment's recommendation that NASA select three additional Discovery class missions during this decadal cycle.
- The NASA Authorization bill should include support for hypersonics research. Support for hypersonics is vital for aeronautics and space research and ensuring our nation's continued leadership in the aviation sector.
- The NASA Authorization bill should include support for NASA's Carbon Monitoring System (CMS) and other similar programs. CMS helps researchers understand how carbon flows through our land, biosphere, waterbodies, oceans, and atmosphere, allowing for better management of these natural resources.
- The NASA Authorization bill should support the Landsat program. The Landsat program is the longest unbroken data stream of Earth's surface, as seen from space. This program is critical to monitoring and understanding the impact of human society on the planet, as well as environmental changes.